

presented by the office of the *American Ephemeris*; W. J. S. Lockyer, Resultate aus Beobachtungen des veränderlichen Sternes η *Aquilæ*; W. Prinz, Esquisses Sélénologiques, presented by the authors; two MS. volumes containing original entries of Capt. Foster's pendulum observations, 1828–31, presented by the Hydrographer.

On some Original Unpublished Observations of the Comet of 1652.

By E. B. Knobel.

In a copy of the second edition of Bayer's *Uranometria* (Ulm, 1639), with which is bound the *Cælum Stellatum Christianum* of Julius Schiller (Augsburg, 1627), which I have recently acquired, there are recorded several observations of the comet of 1652, and as they appear to be for the most part the original observations of the former owner of the work, they are perhaps worth saving from the obscurity in which they have been concealed since that period.

The comet of 1652 was very carefully observed by Hevelius, who devotes the whole of the first book of his "Cometographia" to an exhaustive discussion of his observations, and it was from these materials that the elements of the comet's orbit were subsequently computed by Halley, and published in his well-known "Synopsis," which appeared in the *Philosophical Transactions* for 1705.* Besides his own very important series, Hevelius mentions some observations made by Wendelinus at Tournai, Malvaticæus at Bologna, Christianus at Giessen in Hesse, and by an Englishman at Aleppo, but it is clear that neither of these can be the author of the observations I have discovered. It is probable, however, that the author is indicated in an inscription on the title-page of Bayer, in the same handwriting as that of the observations. This inscription gives an epitome of the title-page of the "Coelum Stellatum," and concludes with the sentence: "A. 1649 pro isto Coelo Stellato petebat D(ominus) Henri(cus) Milius? nuper."

This author had evidently the open maps before him, on which he each night marked down the position of the comet by alignment with the stars, and he wrote on the maps particulars of such alignment with notes and remarks, as well as some observations made elsewhere by others.

Hevelius observed the comet from 1652 December 20 to 1653 January 8. Our unknown author gives the positions of the comet from December 19 to January 3, and there is a note which

* In his "Constantes de l'Astronomie" (*Annales de l'Observatoire de Bruxelles*) Houzeau gives Halley's longitude of perihelion erroneously as $38^{\circ} 10' 40''$; it should be $28^{\circ} 10' 40''$.

indicates that the comet was observed as late as 1653, January 20. These dates are new style.*

From several references in the notes to observations at Cologne, and also to some made at a monastery in Westphalia, I infer that the author may probably have lived at Cologne, where I found the work; indeed, as a matter of fact, the book belonged to the library of a Burgomaster at Cologne when I bought it.

The positions of the comet marked on the maps being those derived solely from alignment with the stars, they are of course of the same epoch as *Bayer's Uranometria*, which is that of *Tycho's Catalogue*, A.D. 1601. I have taken out the longitudes and latitudes from the maps, and reduced the longitudes to 1653, and compared the results with those observations of Hevelius nearest in time, and as these latter were made, as is well known, at Danzig, I have corrected the times given by my unknown author (assumed as for Cologne) to the meridian of Danzig.

The following are the positions and notes exactly as given in the manuscript, on the maps:—

		Longitude.	Latitude.	Notes.
1652	Dec. 19	68 40	36 20 S.	19 Dec. inter pedes <i>Orionis</i> .
	„ 20	66 30	30 20 S.	20 Dec. Bononiæ in Italia h. 3½ post ☉ occasum.
	„ 20	66 20	29 30 S.	20 Dec. contra genu occidentale <i>Orionis</i> .
	„ 21	62 40	18 25 S.	21 Dec. 1652 h. 7¼ post merid. Monasterij Westphaliæ efficiebat Triang. æquilaterū cū duabus scūt <i>Orionis</i> maxime distantibus secundum Henr. Maderton. (?) qui addit 3 fere gr. ad polū ab æquatore.
	„ 21	...	...	21 Dec. contra scutum <i>Orionis</i> Colon. Studiosi.
	„ 21	62 30	17 30 S.	Circa hunc locū visus cometes 21 Dec. a Studiosis Colon. Vespere diei S. Thomæ.
	„ 22	60 10	9 30 S.	22 Dec. h.
	„ 22	60 20	9 30 S.	22 Dec. 1652 Hora 8 sero.
	„ 26	53 20	13 25 N.	26 Dec. 1652 Sero h. 9. Colon.
	„ 26	53 15	13 20 N.	26 Dec. 1652 in Latit. 37 fere visus Cometa sero h. 9.
	„ 27	52 35	15 10 N.	27 Dec. h. 5 mane prope occasū et ideo cū parallaxi quam Dec. 27 eodē detexit vespertina observatis.
	„ 27	...	...	Mane 27 Dec. hora 5 erat inter duas rectas duobus a Pleiadibus ad Lucinissimam in pectore Persei et ab ipsa ad Lucidissimam capitis Medusæ ducta verò linea per utramque stellam pedis.

* There is a possibility of uncertainty about dates in Germany at this period, for though new style was introduced into that country so early as 1584, it was not generally adopted till 1699 November.

	Longitude.	Latitude	Notes.
1652 Dec. 27	52° 15'	16° 30' N.	27 Dec. sero h. 10 exacte obseruauit crucē notatam in Lat. 40 f.
„ 27	52 0	16 30 N.	27 Dec. mihi 25 ab oculo Tauri.
„ 28	52 30	17 30 N.	28 Dec. 1652 Mane h. 5 Coloniae apparebat Cometa.
„ 28	51 20	19 0 N.	28 Dec. sero h. 9 Lat. B. 42½.
„ 29	51 20	21 40 N.	29 Dec. Vesp. h. 8 deficiens Lat. B. 45.
„ 30	...	...	30 Dec. h. 2 post mediam noctē stetit in hac linea inter oculū Medusæ et lucidam in genu Persei ductā sic ut attingeret pene oculum Medusæ, ex occidente imo mane eodem h. 6 iam subingressus eundem oculū ita obnubilabat eum, ut is esset obscurior quam stella p̄xima supra genu.
„ 30	50 25	23 30 N.	30 Dec. h. 6 sero Lat. B. 47 f.
1653 Jan. 3	48 20	28 35 N.	3 Jan. mane h. 4 Latit. 51½ fere.
„ 20	36 20?	43 35 N.?	Hoc triangulū æquilaterum 6½ gr. labi longiore efficiebat Monasterij Westphaliæ 20 die Januarij ad vesperā hora 8.

Positions reduced to 1653, and the times corrected to the meridian of Danzig, compared with Hevelius :—

Date.	Auctor in Bayer.			Hevelius.		
	Time. h m	Long.	Lat.	Time. h m	Long.	Lat.
1652 Dec. 19	?	69 24	36 20 S.	...	...	...
„ 20	8 21 P.M.	67 14	30 20 S.	7 0 P.M.	68 24	30 49 S.
„ 20	?	67 4	29 30 S.	...	...	...
„ 21	8 2 P.M.	63 24	18 25 S.	...	...	...
„ 22	?	60 54	9 30 S.	...	...	...
„ 22	8 47 P.M.	61 4	9 30 S.	...	...	...
„ 26	9 47 P.M.	54 4	13 25 N.	9 0 P.M.	54 0	13 24 N.
„ 26	9 47 P.M.	53 59	13 20 N.			
„ 27	5 47 A.M.	53 19	15 10 N.	2 6 A.M.	54 17	13 53 N.*
„ 27	10 47 P.M.	52 59	16 30 N.	11 44 P.M.	53 23	17 5 N.
„ 27	?	52 44	16 30 N.	...	...	...
„ 28	5 47 A.M.	53 14	17 30 N.	0 13 A.M.	53 14	17 6 N.
„ 28	9 47 P.M.	52 4	19 0 N.	...	...	...
„ 29	8 47 P.M.	52 4	21 40 N.	5 0 A.M.	52 21	20 33 N.
„ 30	6 47 P.M.	51 9	23 30 N.	6 10 P.M.	51 28	23 23 N.
1653 Jan. 3	4 47 A.M.	49 4	28 35 N.	6 47 P.M.	50 10	29 2 N.
„ 20	8 47 P.M.	37 4	43 35 N.			

* Hevelius's Latitude is clearly in error and that in the MS. is more correct.

The comet was not observed by Hevelius on December 19, 21, and 22.

With respect to the above observations, that recorded as made at Bologna on December 20 was probably by Cornelius Malvaticæus mentioned by Hevelius. The comet is indicated as on a line with β *Eridani* and γ *Orionis*. On December 21, at 8.2 p.m. Danzig time, the comet formed an equilateral triangle with π^3 and π^5 *Orionis*. On December 22 it is shown between μ and ρ *Tauri*, and nearly on a line with them. On December 27, probably at 10.47 p.m. Danzig time, the author gives the angular distance of the comet from α *Tauri* as 25° . Hevelius measured the same angle at $5^h 38^m$ Danzig time the same evening and made it $24^\circ 16\frac{1}{2}'$. On this date, at 10.47 p.m. Danzig time, the author shows the comet exactly on a line joining σ and ρ *Persei*, and also on a line joining γ *Arietis* and ϵ *Persei*, these lines being nearly at right angles, and thus form the cross referred to under this date.

On December 28, at 9.47 p.m. Danzig time, the comet is shown between ϵ *Persei* and δ *Trianguli* and exactly on the line joining them. On December 29, at 8.47 p.m. Danzig time, it is on the line joining ξ and β *Persei*, and also on the line joining δ and ω *Persei*. On December 30, at 2 hours "post mediam noctem," 2.47 a.m. Danzig time, the comet was on the line joining ϵ and β *Persei*; and on January 3 the comet made a right angle with α and β *Persei*, and was situated slightly south of a line joining α *Persei* and γ *Andromedæ*.

With respect to the observation dated January 20 at 8 p.m., "Hoc triangulum æquilaterum $6\frac{1}{2}$ gr. labi longiore efficiebat Monasterii Westphaliæ 20 die Januarii ad vesperam hora 8," the point marked on the map is about $6\frac{1}{2}^\circ$ from each of the two stars in the Sword of Perseus, marked v and g in Bayer, = Fl. 1 and Fl. 4, which are also about $6\frac{1}{2}^\circ$ from each other. But there must necessarily be a doubt whether the comet was really observed in this position. From December 23 to January 7 the position of the comet had altered in longitude only 9° , whereas in latitude it had moved 35° . On this latter date it was about 2° south of τ *Persei*, where it was last seen by Hevelius. From January 4 to January 7 the apparent motion of the comet was slow, in a path passing between γ and τ *Persei*; and it is extremely difficult to understand how it could be in the position assigned on January 20. If it be true, it is an important observation; but there is a suspicion of a mistake, seeing that the assigned place on January 20 is very close to two stars θ and μ *Cassiopeiæ*, which are within $52'$ of longitude and $18'$ of latitude of each other, and in hazy weather might thus have led the observer to believe that he saw the comet. The Moon was not above the horizon at the time.

Hevelius observed the comet from December 20 to January 8, but in his Table of Comets he states that it lasted till 1653 January 10; and he further makes a statement respecting the distance of the comet "vero 12 Januarii." His remarks on its

motion, as translated by Sherburne (*Manilius*, p. 210), are :—
 “Its motion was constantly retrograde, from South to North, by the Hare, Foot of *Orion*, *Taurus*, to the *Pleiades*; and from thence as far as *Perseus*; not directly but obliquely from East South East to North North West, in a great circle inclined to the Ecliptick, and *Æquator*: At first by its diurnal motion compleating $11^{\circ} 16'$, at last $30'$, it ran through in the time of its duration $65^{\circ} 51'$ passing beyond and beside the course of the Annual Orb.”

Hevelius declares positively that the comet disappeared after January 10. His words are : “*Quamobrem serio sum persuasus ultimo hâc die esse visum ; et postmodum à nemine observatum esse : quemadmodum et mihi, die 11 Januarii, nusquam apparuit.*” There is a further marginal note : “*Nullus, præter autorem, cometam ad 11 usque Januarii observavit.*”

The observations of December 21, 26, 27, 28, 29, 30, and January 3, which state that the “latitude” of the comet was 3° , 37° , 40° , $42\frac{1}{2}^{\circ}$, 45° , 47° , and $51\frac{1}{2}^{\circ}$ respectively, must not be taken as the latitude from the ecliptic; but they are what Hevelius terms “*Distantia ab intersectione Æquatoris*”—that is to say, the angular distance of the comet from the equator in its apparent orbit considered as a great circle.*

On the Straightness of Spider Lines.

By H. H. Turner, M.A., B.Sc., Savilian Professor.

1. The gist of the following note is that the horizontal wire of the Greenwich Transit Circle is sensibly straight. I was led to examine this point from hearing that a curvature or “sag” of the horizontal wire had been detected elsewhere. If such a curvature existed it would specially affect the R—D observations, and might form a considerable part of this curious phenomenon.

2. The method adopted was to take from the section of observed zenith-distances in the volumes of Greenwich Observations for 1892 and 1893 all those cases in which a star had been observed in zenith-distance at the vertical wires 1, 2, 6, 7. The readings of the micrometer at wires 1 and 7 were subtracted

* In the copy of Bayer under consideration, the author of the observations has designated the group of stars 33, 35, 39, and 41 *Arietis* as “*Nubes Tauri* vel *Halitus Arietis*.” These stars formed the constellation “*Musca*,” or “*Apes*,” of Jacobus Barthius, the son-in law of Kepler, and I am unaware of any other designation for them than his. The explanation of “*Nubes Tauri*” is that the stars are situated on the confines of the cloud which conceals the body of the Bull, as shown in the old drawings of the constellations in Aratus and Hyginus, and in Bayer. “*Halitus Arietis*” is explained by the face of the Ram being turned in the direction of these stars, and thus the animal’s breath would cover them.